

The background features an abstract geometric design. In the upper half, there are several overlapping yellow polygons, including a large central one and several smaller ones around it. In the lower half, there is a large, dark brown, irregular shape that resembles a stylized banner or a piece of fabric. Below this banner, there are two solid brown circles, one on the left and one on the right, positioned as if they are wheels or supports for the banner.

Sizzilin Styles of Symmetry

Learning Unit Created By:

Lori Rentz
and
Jaclyn Bangert

Title: Sizzilin Styles of Symmetry

Brief Overview:

This unit focuses on exploring basic shapes through patterns and symmetry. In addition, students will analyze and construct symmetrical objects and patterns. At the end of the unit students will follow a given vignette to create a symmetrical butterfly.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

• Content Standards

Geometry

- *Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; investigate, describe, and reason about the results of subdividing, combining, and transforming shapes; and explore congruence and similarity.*
- *Specify locations and describe spatial relationships using coordinate geometry and other representational systems; and describe location and movement using common language and geometric vocabulary.*
- *Apply transformations and use symmetry to analyze mathematical situations; and describe a motion or a series of motions that will show that two shapes are congruent.*
- *Use visualization, spatial reasoning, and geometric modeling to solve problems; build and draw geometric objects; create and describe mental images of objects, patterns, and paths; use geometric models to solve problems in other areas of mathematics, such as number and measurement; and recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life.*

- **Process Standards**

- **Problem Solving**

- *Instructional programs from prekindergarten through grade 12 should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; and monitor and reflect on the process of mathematical problem solving.*

- **Reasoning and Proof**

- *Instructional programs from prekindergarten through grade 12 should enable all students to recognize reasoning and proof as fundamental aspects of mathematics.*

- **Communication**

- *Instructional programs from prekindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; Andes the language of mathematics to express mathematical ideas precisely.*

- **Connections**

- *Instructional programs from prekindergarten through grade 12 should enable all students to recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; and recognize and apply mathematics in contexts outside of mathematics.*

- **Representation**

- *Instructional programs from prekindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas.*

Grade/Level:

Grades 2-3

Duration/Length:

This unit will take approximately five class periods of 50 minutes each.

Prerequisite Knowledge:

Students should have the working knowledge of the following skills:

- Recognizing basic shapes
- Creating simple patterns
- Basic understanding of geoboards
- Familiar with the writing process

Student Outcomes:

Students will:

- create a repeating pattern.
- construct a symmetrical object using shapes and colors.
- describe a repeating pattern.
- determine reasons for symmetrical objects.
- identify the line of symmetry.
- work cooperatively with a partner.

Materials/Resources/Printed Materials:

- Overhead
- Overhead pattern blocks and markers
- Pattern blocks
- Overhead Geoboard
- Class set of geoboards with rubber bands
- Sentence strips
- Markers/Crayons
- Hand held mirrors
- Yarn
- The Quilt Story
- Student Resource Sheets #1-8
- Teacher Resource Sheet #1-3
- Construction paper
- Teacher generated vocabulary cards
- 8 1/2 by 11 inch paper

Development/Procedures:

Day One

- Share the book, The Quilt Story. Then discuss quilts and their purpose. Have students think-pair-share about other patterns they have seen in their classroom and in real life.
- Partners will verbally share their patterns with the class.
- Possible discussion questions:
 - *What is a pattern?
 - *How do you know it is a pattern?
 - *Does color determine a specific pattern?
 - *Does shape play a part in the pattern?
- Show an example of a simple pattern with basic shapes and colors on the overhead with overhead pattern blocks. Have students explain why this example is a pattern and what would come next to complete the pattern.
- Show an example of shapes and colors that do not create a pattern. Have students explain why this is not an example of a pattern.
- Tell students that they will be creating an example of a simple repeating pattern.
- Distribute one sentence strip to each student. Allow students to access pattern blocks if needed during tasks. Give students five to seven minutes to complete the task. Have students exchange their patterns with a partner. Partner will complete pattern by repeating it one time on the sentence strip. Discuss patterns with class.

- Have students complete a written explanation responding to the following questions (Student Resource Sheet #1):

- *Is this an example of a pattern? Give reasons why it is a pattern.
- *What shapes and colors did you use?
- *How many times did the pattern repeat itself?

- Display patterns along with written explanations underneath.

Closure

- Play a quick review game by throwing a ball to different students so they can discuss one interesting thing that they learned about patterns.
- Homework- Find at least three patterns at home and record.

Day 2

Warm-up

- Have students revisit patterns and explanations from yesterday.
- Distribute pattern blocks and reusable pattern mats(Student Resource Sheet #2).
- Have the students create several patterns using blocks by following these directions:
 - *Create a pattern using a square, triangle, and circle. Place pattern on mat next to number one. Repeat this pattern three times on the mat.
- Teacher will make informal observations of the students as they work.

Activity

- Teacher will show the class a standard piece of paper. Ask student to make predictions about what will happen when the paper is folded in half. Ask students what will happen if the paper is folded again in a different direction. Unfold paper to discuss the two lines of symmetry made by the folds.
 - Teacher will lead a discussion introducing the following vocabulary:
 - *symmetry, line of symmetry, equal parts, congruent, and non-congruent.
- Refer to folded paper to further explain vocabulary words.
The discussion will also explain non-congruent shapes and examples.
- Place vocabulary cards around the room for future reference.
 - Distribute symmetrical die-cuts of shapes such as apples, balloons, and circles to students. Students will identify lines of symmetry by folding die-cuts in half and using a piece of yarn to represent the line of symmetry. Show students how to fold shape in half, using the line of symmetry as a reference. Once shape is folded hold the fold up to a mirror. Show the students how a congruent image will appear of that shape. This a way to check for symmetry. If the image that appears in the mirror is the same shape as the other part of the die-cut then the object is symmetrical.
 - Distribute non-symmetrical die-cuts such as school bus, right triangle, and school mascot. Repeat procedure above. Use mirrors to explain how the mirror can also be used to help indicate non-symmetrical objects. Students will explain why these shapes are not congruent or symmetrical.

Closure

- Show the students that they can create a symmetrical shape by following the procedure below:
 - Fold a piece of paper in half.
 - Start at the top of the folded side and begin to draw a shape that ends at the bottom of the folded side.
 - Keep paper folded and cut your shape out.
 - Unfold to see a symmetrical shape.
- Homework- Students will create a symmetrical object following the procedure above using a piece of construction paper.

Day 3

Warm-up

- Have students take out their homework and switch shapes with a partner. Using yarn, the partner will identify the line of symmetry. Also, hand mirrors should be provided for students to help them determine if their partner's shape is in fact symmetrical. Teacher can also challenge the students by asking them to find more than one line of symmetry. Teacher will monitor student progress and call on several students to share and explain why their object is symmetrical.

Activity

- Show overhead geoboard. Make several shapes that are congruent and not congruent. Have students respond to the shapes by using thumbs up for congruent shape and thumbs down for non-congruent shapes.
- Distribute geoboards, yarn, and rubber bands to each student. Allow a few minutes for exploration. Have the students create a square on their geoboards and then use yarn to show the line of symmetry. Continue creating shapes until the students are comfortable using geoboards.
- Students will now create 4 congruent and 4 non-congruent shapes on the geoboard and then record their results on geoboard paper. (Student Resource Sheet #3)

Closure

- Journal entry- Write at least 2 sentences explaining what you learned about symmetry using at least 3 math vocabulary words.
- Homework- Student Resource Sheet #4. Answers are found on Teacher Resource #1.

Day 4

Warm-up

- Display and share the following vignette (Student Resource Sheet #5) on the overhead.

Vignette for a Bodacious Butterfly

Due to an overwhelming demand from parents, teachers, and students the principal has decided to make the new school mascot a bodacious butterfly. The butterfly was chosen because it represents beauty and uniqueness. The principal has asked that each student create a butterfly mascot that can be used to represent the school in a positive manner.

Your task will include the following :

- Name, teacher, and grade must be printed on the back of your butterfly.
 - Butterfly needs to be symmetrical.
 - Three to five** colors need to be used on your butterfly.
 - Three to five** basic shapes need to be used for the design of the wings.
 - Create an appropriate name for your bodacious butterfly and write it on top of your paper.
-
- Explain to the students that they will be following a process similar to the writing process. The process will include time to brainstorm, verbally share ideas, draft, partner conference(see Student Resource Sheet #7), and publish. The students will be given the rest of today's time to begin their rough draft and tomorrow to complete the process.
 - Display the rubric (Teacher Resource Sheet #1) on the overhead.
 - Explain and discuss the rubric.
 - Show Student Resource Sheet #6 to introduce the outline of the butterfly.
 - Have students choose a partner to brainstorm ideas for their butterflies.
 - Then, they may begin to create their drafts.

Closure

- Informally assess the pace of the student's work by asking and recording the progress of each student.
- Explain to the students that tomorrow they will be given time to partner conference about their butterflies. Show them the Student/Partner Checklist (Student Resource #7) and explain how it will be used to give their partner feedback.
- Emphasize the agenda for tomorrow and the importance of completion of the project.

Day 5

Warm-up

- Brief warm-up with pattern blocks creating simple, symmetrical patterns.
- Teacher will monitor progress

Activity

- Revisit butterfly vignette to review project and rubric.
- Have students take out drafts of butterflies.
- Allow students time to partner conference, if needed, and complete final drafts.

Closure

- Gather in circle to share, discuss, and display final copies of butterflies.
- Review rubrics and student checklist (Teacher Resource Sheet #1 and Student Resource Sheet #7).
- Distribute geometry quiz for formal assessment of unit (Student Resource Sheet #8 and Teacher Resource Sheet #2).

Performance Assessment:

Assessments will be ongoing. The tasks will include scoring tools Teacher Resource Sheets #1, #2, and #3). Students will be informally assessed on the following:

- Teacher observation
- Individual and partner participation
- Completion of assignment

Extension/Follow Up:

- Examine and further study the symmetrical shapes of butterflies and their life cycle.
- Respond to a prompt that has the students writing to persuade the principal to choose his or her symmetrical butterfly design.
- Use Kid Pix to create symmetrical shapes and patterns.

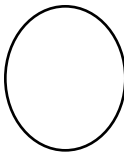
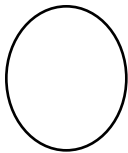
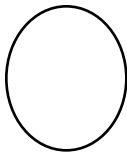
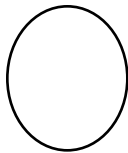
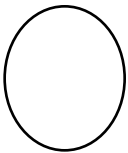
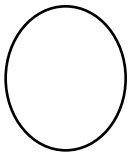
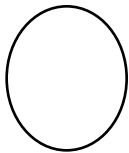
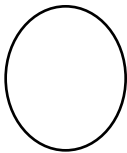
Authors:

Jaclyn Bangert
Bakerfield Elementary Elementary
Harford County, Maryland

Lori Rentz
Bakerfield Elementary Elementary
Harford County, Maryland

Name _____

Date _____









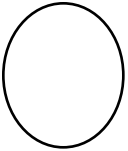
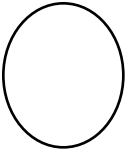
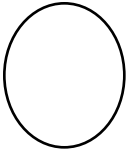
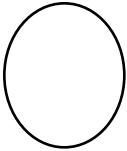
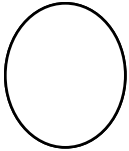
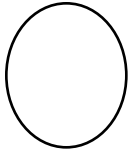




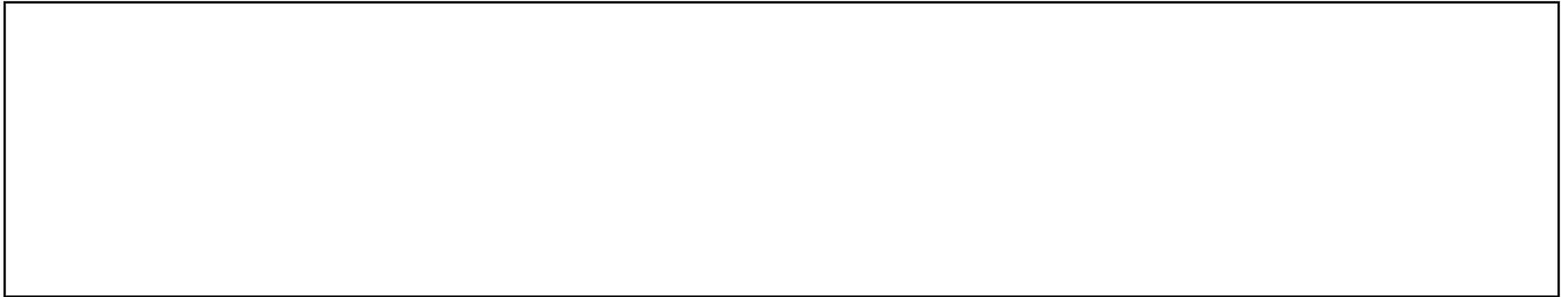




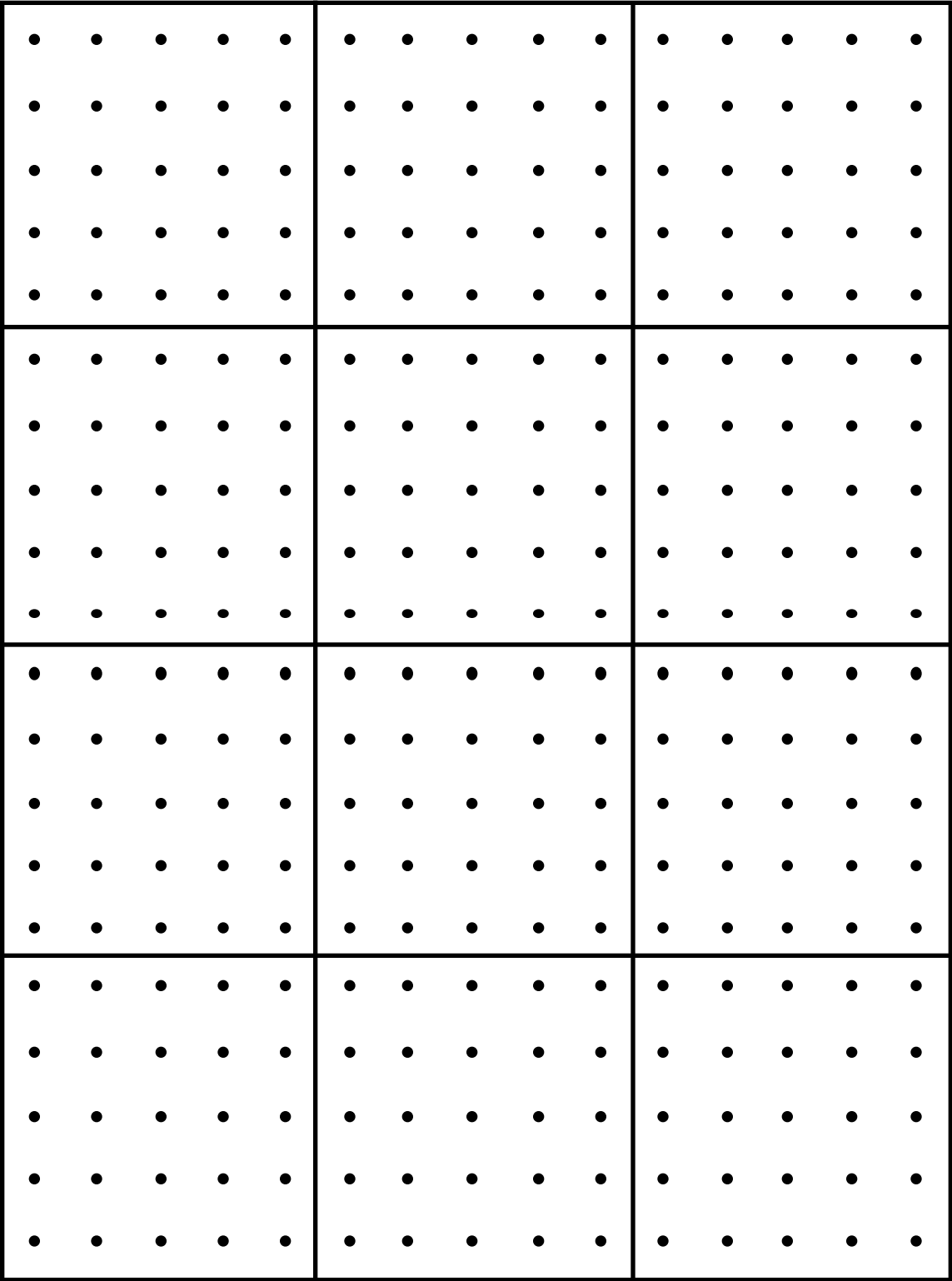




Pattern Mat

A large, empty rectangular box with a thin black border, intended for a student to draw or write a pattern.A large, empty rectangular box with a thin black border, intended for a student to draw or write a pattern.A large, empty rectangular box with a thin black border, intended for a student to draw or write a pattern.

Student Resource #3



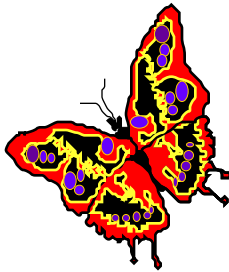
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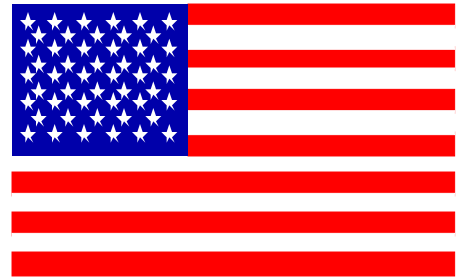
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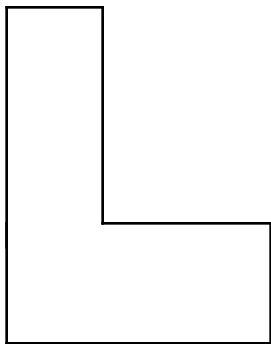
Directions

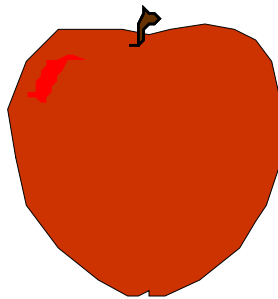
Circle the shapes that are symmetrical. Then identify the line of symmetry with a piece of yarn. After identifying your line of symmetry, draw your line with your pencil. Finally, write the number of lines of symmetry that you have identified.

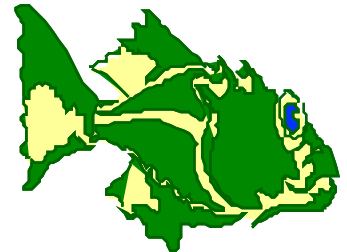


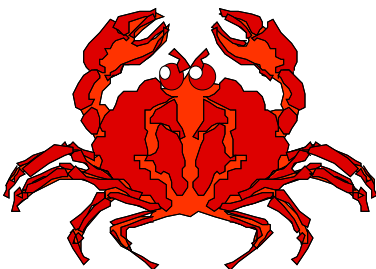


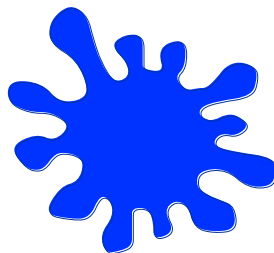


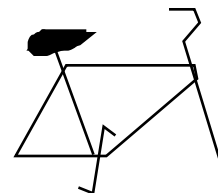


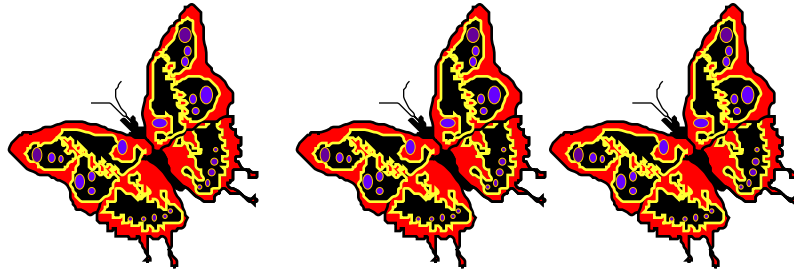








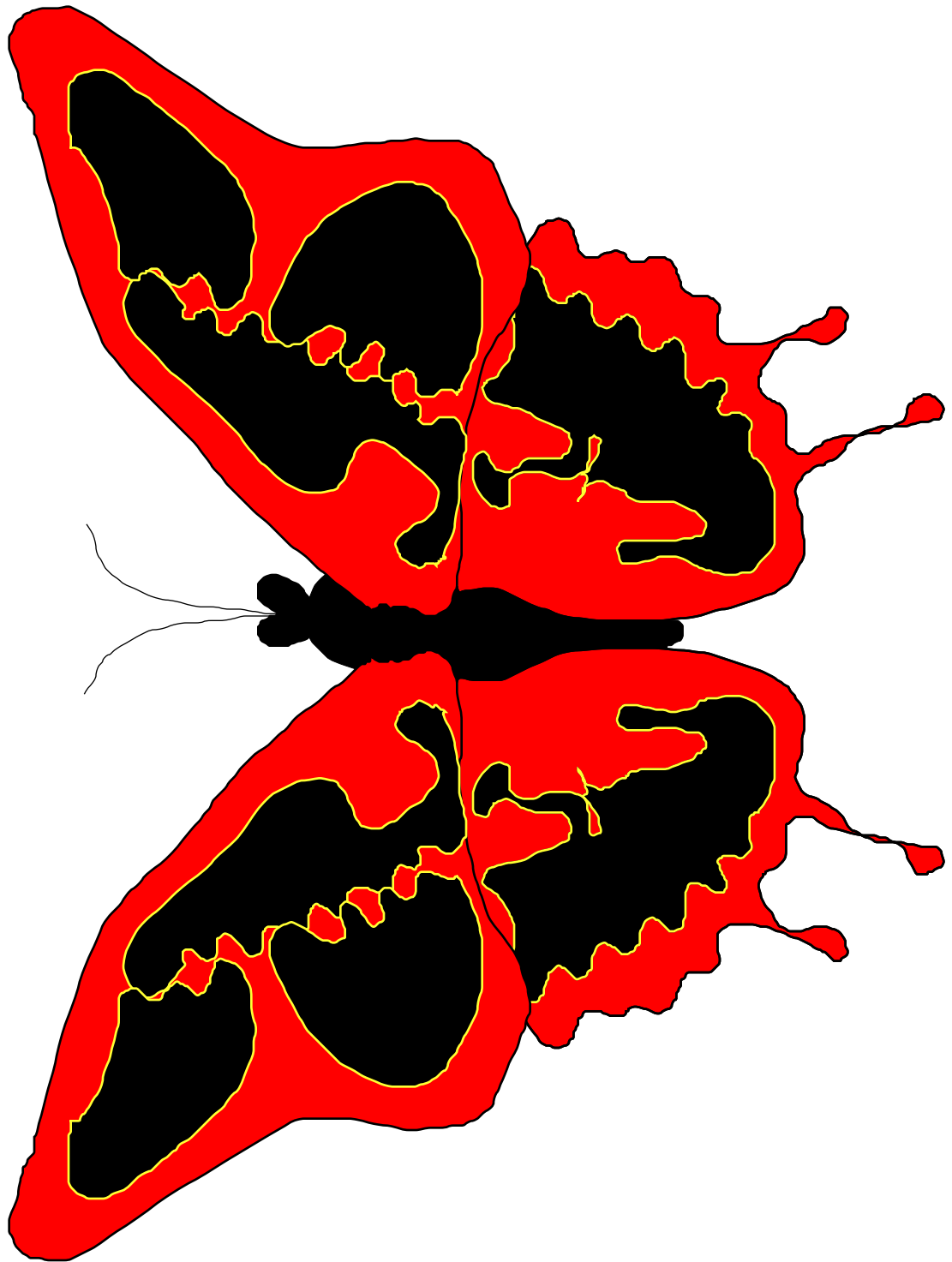




Vignette for a Bodacious Butterfly

Due to an overwhelming demand from parents, teachers, and students, the principal has decided to make the new school mascot a bodacious butterfly. The butterfly was chosen because it represents beauty and uniqueness. The principal has asked that each student create a butterfly mascot that can be used to represent the school in a positive manner. Your task will include the following:

- Name, teacher, and grade must be printed on the back of your butterfly.
- Butterfly needs to be symmetrical.
- **Three to five** colors need to be used on your butterfly.
- **Three to five** basic shapes need to be used for the design of the wings.
- Create an appropriate name for your bodacious butterfly and write it on the top of your paper.



Date _____

Needs Improvement

1. Did my partner use 3 to 5 colors on their butterfly?
2. Did my partner use 3 to 5 basic shapes such as circle, square, triangle, or rectangle?
3. Is my partner's butterfly symmetrical?
4. Did my partner put his/her name, date, and teacher on his/her butterfly?
5. Did my partner name his/her butterfly?
6. Please write two things you like about your partner's butterfly?

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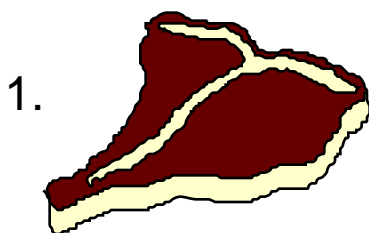
Name _____ Date _____

Geometry Quiz

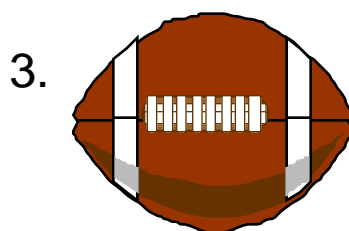
Read the directions for each section and complete.

Section 1

Circle the shapes that are symmetrical and draw a line of symmetry through those objects. Finally, write the number of lines of symmetry that you have identified.

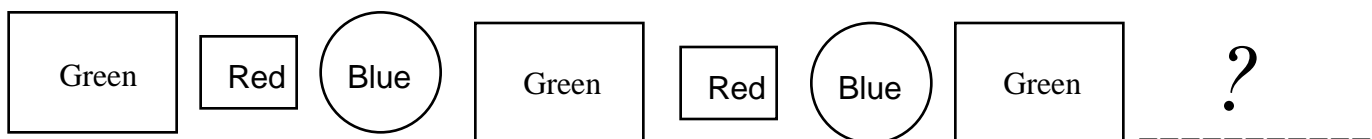






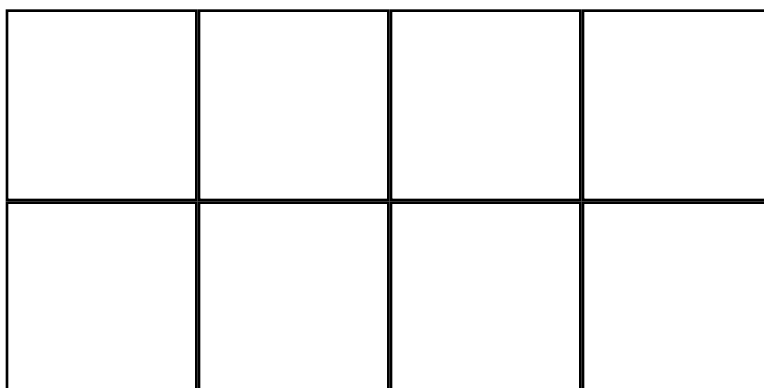
Section 2

Color the shapes and then complete the pattern.



Section 3

Draw a line of symmetry through the shape below.
Color the shape symmetrically.



** Lines of symmetry are not completely accurate due to computer functions.

Teacher Resource #1

Name _____

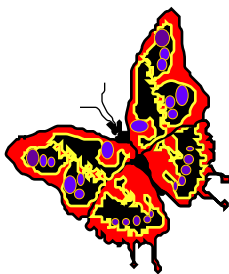
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Directions

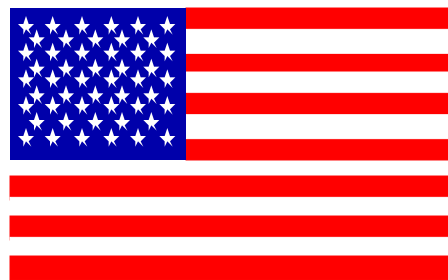
Circle the shapes that are symmetrical. Then identify the line of symmetry with a piece of yarn. After identifying your line of symmetry, draw your line with your pencil. Finally, write the number of lines of symmetry that you have identified.



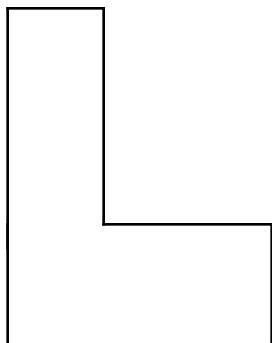
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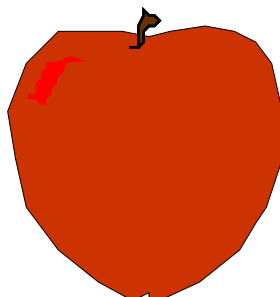
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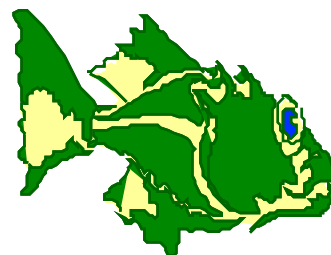
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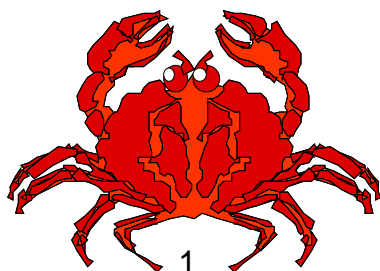
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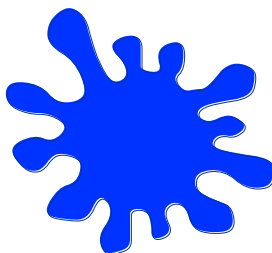
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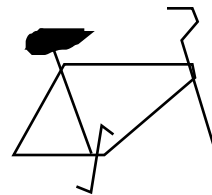
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Bodacious Butterfly Rubric

	Symmetrical butterfly	3 to 5 colors	3 to 5 basic shapes	Name created for butterfly	Name, date, and teacher
5	All shapes and colors are symmetrical on the butterfly's wings.	Has 3 to 5 colors on the butterfly.	Has 3 to 5 basic shapes on the butterfly.	Has name created for the butterfly.	Has name, date, and teacher on the butterfly.
4	1 shape and color is not symmetrical on the butterfly's wings.	Has only 2 colors on the butterfly.	Has only 2 basic shapes on the butterfly.	↑	Has 2 of the 3 above.
3	2 shapes and colors are not symmetrical on the butterfly's wings.	Has only 1 color on the butterfly.	Has only 1 basic shape on the butterfly.		Has 1 of the 3 above.
2	3 shapes are not symmetrical on the butterfly's wings.	Has 6 colors on the butterfly.	Has 6 basic shapes on the butterfly.		↑
1	4 shapes and colors are not symmetrical on the butterfly's wings.	Has 7 colors on the butterfly.	Has 7 basic shapes on the butterfly.	↓	↓
0	There are no symmetrical colors or shapes on the butterfly's wings.	Has more than 8 colors on the butterfly.	Has more than 8 basic shapes on the butterfly.	Does not have a name created for the butterfly.	Does not have name, date, or teacher on the butterfly.

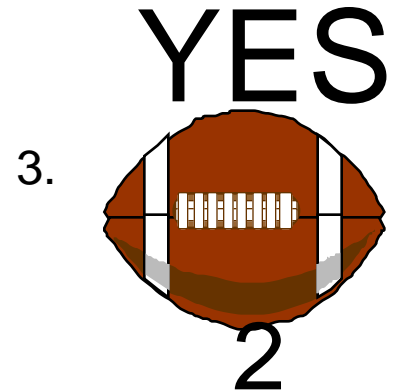
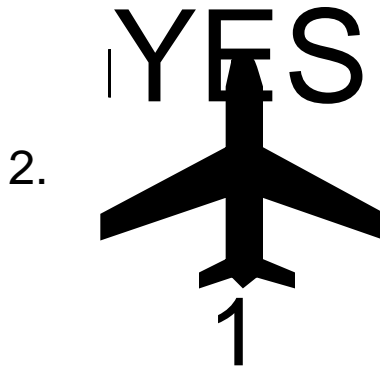
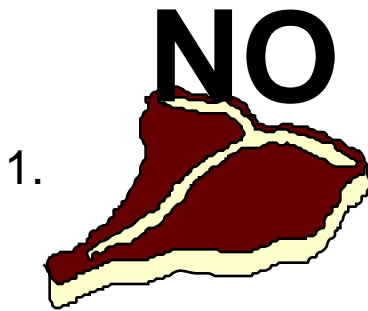
Name _____ Date _____

Geometry Quiz

Read the directions for each section and complete.

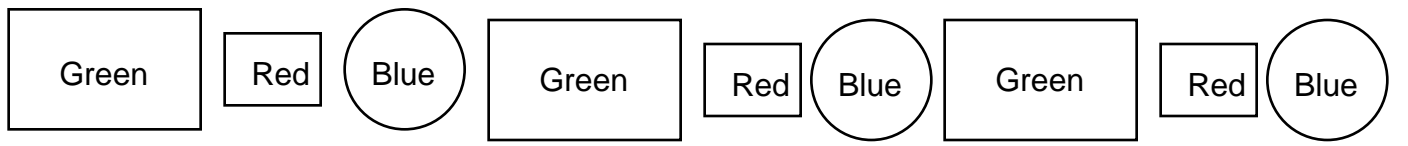
Section 1

Circle the shapes that are symmetrical and draw a line of symmetry through those objects. Finally, write the lines of symmetry that you have identified.



Section 2

Color the shapes and then complete the pattern.



Section 3

Draw a line of symmetry through the shape below.
Color the shape symmetrically.

COLORS WILL VARY

